REMARKS

Applicants appreciate the thoroughness with which the Examiner has examined the above-identified application. Reconsideration for an allowance is requested in view of the amendments above and the remarks below.

Rejections under 35 U.S.C. § 112

The Examiner has rejected claims 1-5 and 21 under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Specifically, claim 1 cites "said apparatus" in line 2 for which there is insufficient basis. Applicants concur and have amended claim 1 to replace "said apparatus" with "said article."

Rejections under 35 U.S.C. § 103

The Examiner has rejected claims 1-5 and 21 under 35 U.S.C. § 103(a) as being unpatentable over Chittipeddi, et al. (U.S. Patent No. 6,472,304) in view of Sakane, et al. (JP 56-017048). Applicants respectfully disagree.

The Examiner submits that Chittipeddi teaches an alloying metal deposited on a metallic interconnect. In support of this, the Examiner identifies the copper interconnect of Chittipeddi ("13", Fig. 1 or "44", Fig. 21) and an alloying metal ("74", Fig. 21). This, however, is not an accurate depiction of the structure of the present invention.

First, the present invention requires an alloying cap to be placed on a copper interconnect. There is either a barrier cap or nothing between the copper interconnect and the alloying cap.

> The copper interconnect 12 is covered by a barrier cap 14 and passivation layer 16. The passivation layer 16 includes a gap 18 for placement of a wire bond (not shown). Attached to the barrier cap 14 or in place of a portion of the barrier cap is a low temperature alloying element cap 20. Specification, p.9, ll.5-9.

Chittipeddi does not teach this. Chittipeddi's metal interconnect 13 has on top of itself the following additional layers: a dielectric layer 14; a "window plug" material, e.g., a TiN layer 21 and a tungsten layer 22; a "metal" plug 23; a dielectric layer 31; a barrier layer 41 of Ta, TaN, Ti, or TiN; a copper strike layer 42; a copper layer 43; a second barrier layer 73 (similar to barrier layer 41); and an aluminum layer 74. Chittipeddi, col. 2, l.54 – col. 3, l.67; Figs. 14, 21 and 22. If, as the Examiner postulates, the aluminum bond layer is the purposeful alloying layer of the present invention (which applicants disagree), this layer is certainly not *on* the metal interconnect layer as claimed in claim 1, or for that matter on a barrier layer attached directly to the metal interconnect layer, as shown in an alternative embodiment of the present invention. *See, e.g.*, Figs. 1 and 2, items "12" and "20"; Figs. 3 and 4, items "32" (aluminum bond pad), "40" (barrier layer), and "42" (alloying layer).

Additionally, Applicants respectfully submit that the aluminum layer 74 of Chittipeddi is the bond pad itself, *not* the alloying layer.

> Aluminum layer 74 is then masked with mask 76, as shown in Fig. 22, *and layers 74 and then 73 are etched to form aluminum bond pad 77 in Fig. 23.* Chittipeddi, col. 3, ll.65-67 (emphasis added).

In the present invention the alloying material is placed *between* the bond wire and the bond pad.

> An approach is presented to increase the reactivity *between the bond wire and the bond pad*, thereby allowing for reduced pressure and ultrasonic and thermal energy during wirebonding. *This approach is to use a metal alloy on top of the bond pad* that reacts at low temperatures with the bond wire. Specification, p.7, l.30 – p.8, l.2 (emphasis added).

> The aluminum bond pad or via 32 is deposited and capped with a second TiN layer 40 or similar refractory metal, metal alloy, or metal nitride barrier. ... *The alloying material of the present invention is applied over the TiN cap.* Specification, p.9, ll.25-26 (emphasis added).

Chittipeddi does not teach an alloying material applied over its metal interconnect or over a barrier layer that is placed directly over the metal interconnect. If, as the Examiner states, one were to "deposit Ni-Sn on the copper interconnect of Chittipeddi, et al., to enable the formation of Au-Sn alloy which prevents migration of species across the interconnect," this would mean placing a Ni-Sn layer on metal interconnect layer 13, which, if one then follows the teaching of Chittipeddi, would require over the "alloying material": the dielectric layer 14; the "window plug" layer (TiN layer 21 and a tungsten layer 22); the "metal" plug 23; the dielectric layer 31; the barrier layer 41; the copper strike layer 42; the copper layer 43; the second barrier layer 73; and the aluminum bond pad 74. These layers would necessarily separate the proposed Ni-Sn alloying layer from the wire.

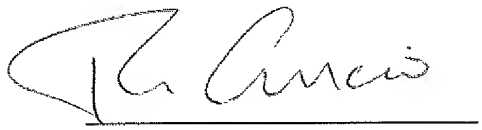
The Examiner further states that "Sakena [*sic*] et al. teaches applying a nickel-tin alloy as a barrier layer on the metalized surface with the result that a gold-tin alloy is formed between the gold from the wire and the tin from the alloy deposited." Office Action, p.4. Applicants respectfully submit that this is contrary to claim 1 of the present invention. Claim 1 specifically states, in pertinent part: "said alloying metal comprising alloying metals *other than* said metallic wire material." Claim 1 (emphasis added). Consequently, Sakane is teaching away from the invention of claim 1.

Applicants submit that for the reasons cited above the combination of Chittipeddi and Sakane does not teach, disclose, or suggest the salient features of the present invention

as described in claims 1-5 and 21. It is submitted that the claims remain patentably distinct over this cited prior art.

It is respectfully submitted that the application has now been brought into a condition where allowance of the entire case is proper. Reconsideration and issuance of a notice of allowance are respectfully solicited.

Respectfully submitted,



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